hiprom technologies

EN2PA

Allen-Bradley Logix
to Profibus PA interface

USER MANUAL

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CHAPTER 1 INTRODUCTION

The 1788HP-EN2PA is a Profibus PA Master which connects an Allen-Bradley Logix Controller (via Ethernet/IP) to various Profibus PA field devices.

The user can configure each 1788HP-EN2PA to exchange cyclic data with up to 16 Profibus PA Field Devices using RSLogix 5000 and HSNetworxPA.

The module can also be used to exchange acyclic data with each field device using FDT-DTM technology. Each field device can be configured in detail by using Hiprom Technologies' DTM package and a FDT frame (e.g. FieldCare).

This document serves to describe the functionality, installation, configuration and operation of the module.

CHAPTER 2 MODULE OPERATION & INSTALLATION

The 1788HP-EN2PA module is designed to operate within the Allen-Bradley Logix controller system using CIP Ethernet. All power required for the module's operation must be derived from an external 24V power supply. Please refer to electrical specifications for current consumption.

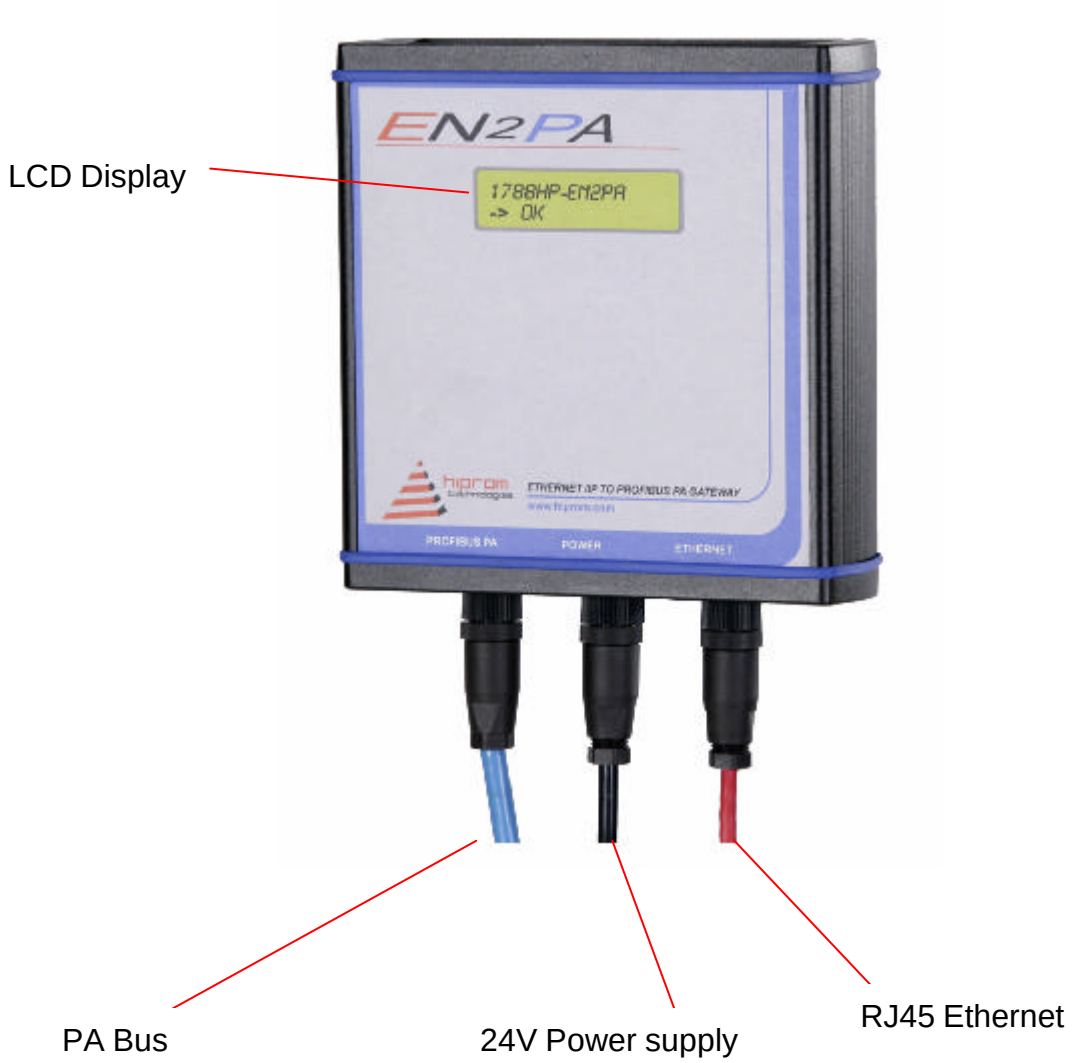

Figure 2.1: 1788HP-EN2PA Layout

PABUS: Connector Pin 1 -> PA "+" terminal, Connector Pin 3 -> PA – terminal. Pin 4 is used for the cable shield.

24V PWR: Connector Pin 1 -> "+" terminal, Connector Pin 2 -> "-" terminal

RJ45: Connector Pin 1 & 3 and Connector Pin 2 & 4 are twisted pairs as shown below in figure 2.2.

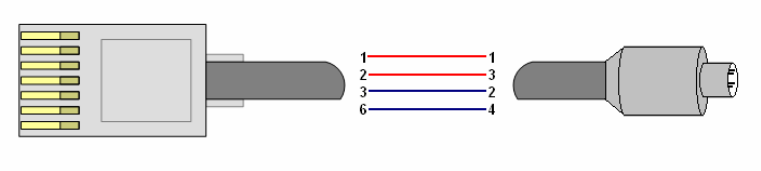

Figure 2.2: Ethernet cable layout

The current status of the module is conveyed to the user by means of the LCD Display. Appendix A details the various states of the LCD Display messages.

The following information is available and can be sent by the user directly across the backplane by means of a scheduled connection:

- 8 Input process variables (PVs) and 8 Output PVs from up to of 16 Profibus PA field devices.
- Diagnostics from the 1788HP-EN2PA module
- Extended diagnostics of each Profibus PA field device
-

The positive terminal of the 1788HP-EN2PA's Profibus PA connector (as shown in figure 2.1) must be connected to the positive terminal of all connected Profibus PA instruments (if standard Profibus PA cable is used the standard is *red* – positive, *green* – negative).

Warning:
If the positive and negative terminal of the EN2PA is not correctly connected to the positive and negative terminals of the respected Profibus PA field devices it may cause permanent damage to the connected instruments.

CHAPTER 3 CONFIGURING THE MODULE

A direct connection between the controller and the 1788HP-EN2PA module is required to transfer drive data to and from the module.

3.1. Establishing the Direct Connection

This section describes the procedures required to configure the 1788HP-EN2PA module within the Logix platform. Each 1788HP-EN2PA module must be owned by a single Logix controller. The 1756 Generic EtherNet/IP CIP Bridge module is used in RSLogix 5000 to provide an interface for the Profibus PA fieldbus. Once this is added a Generic CIP module is used to configure the master and each field device. The configuration of the modules is described in the tables below.

PA MASTER

Data Format		
CommFormat	Data – DINT	
Connection parameters		
Description	Instance	Size
Input	65	4 (32 Bit)
Output	66	1 (32 Bit)
Configuration	68	4 (8 Bit)
Recommended RPI	150.0ms	

Table 3.1: 1788HP-EN2PA PA MASTER connection parameters.

FIELD DEVICE

Data Format		
CommFormat	Data – DINT	
Connection parameters		
Description	Instance	Size
Input	65	26 (32 Bit)
Output	66	10 (32 Bit)
Configuration	68	50 (8 Bit)
Recommended RPI	150.0ms	

Table 3.2: 1788HP-EN2PA FIELD DEVICE connection parameters.

The steps required to build a Profibus PA tree in RSLogix 5000 are described below.

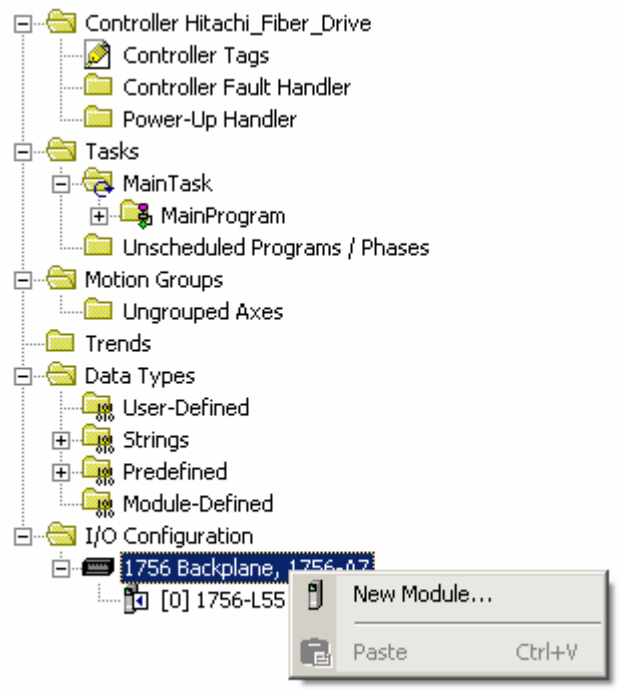

Figure 3.1: Right-click on the 1756 Backplane and select New Module.

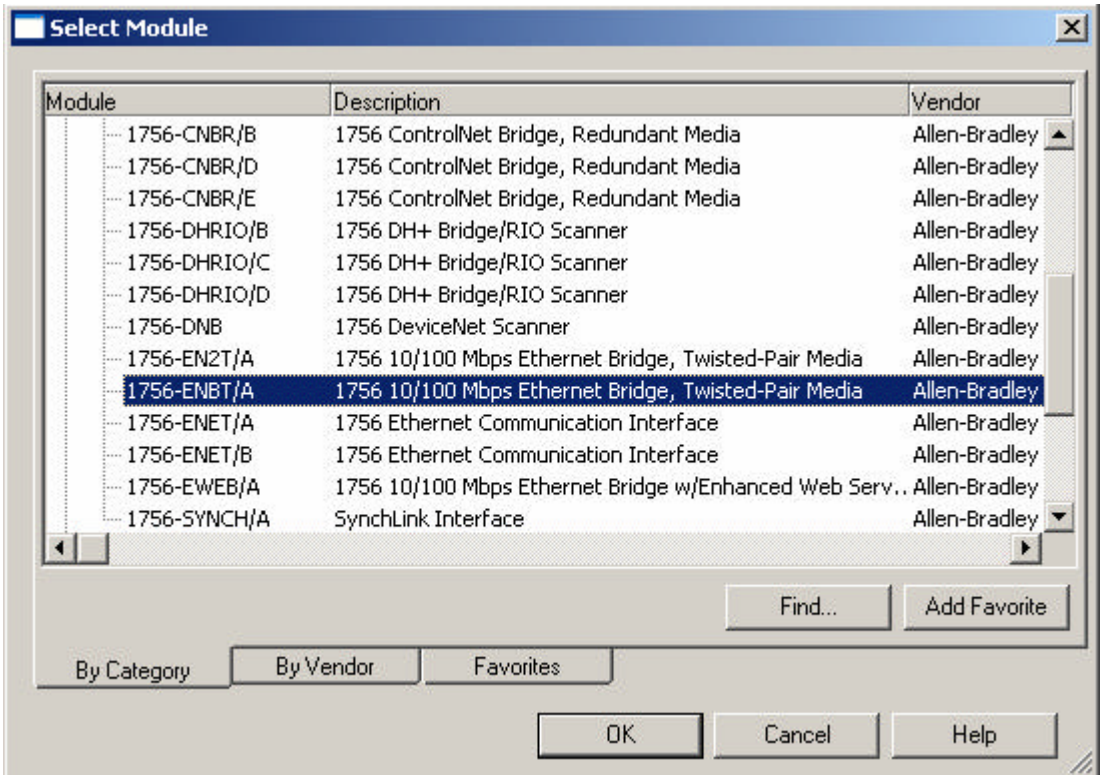

Figure 3.2: Select 1756-ENBT/A.

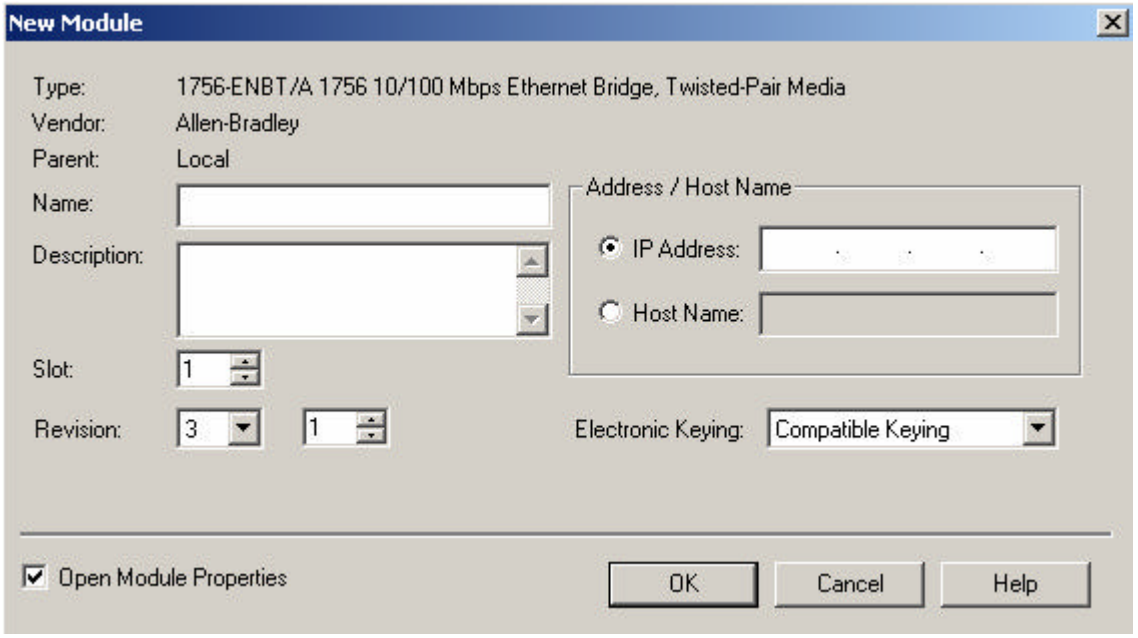

Figure 3.3: Configure the 1756-ENBT/A parameters.

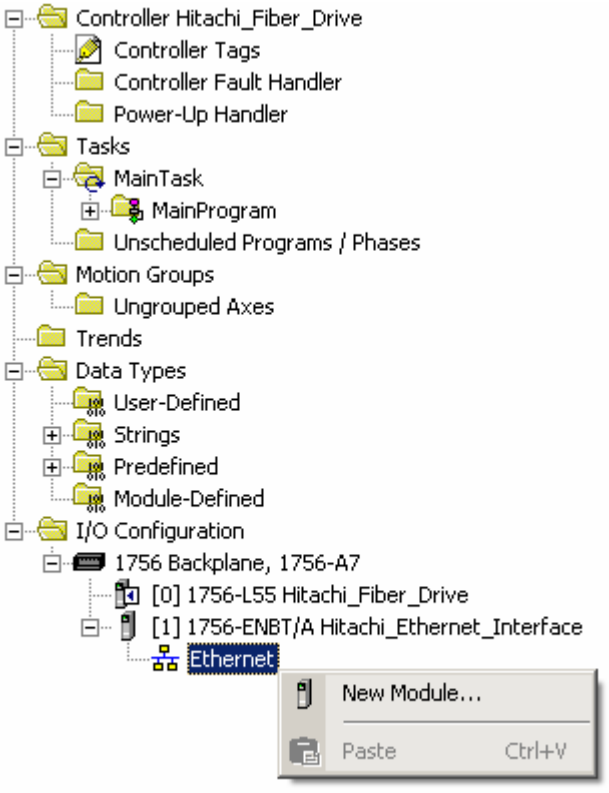

Figure 3.4: Right-click on the Ethernet tree and select New Module.

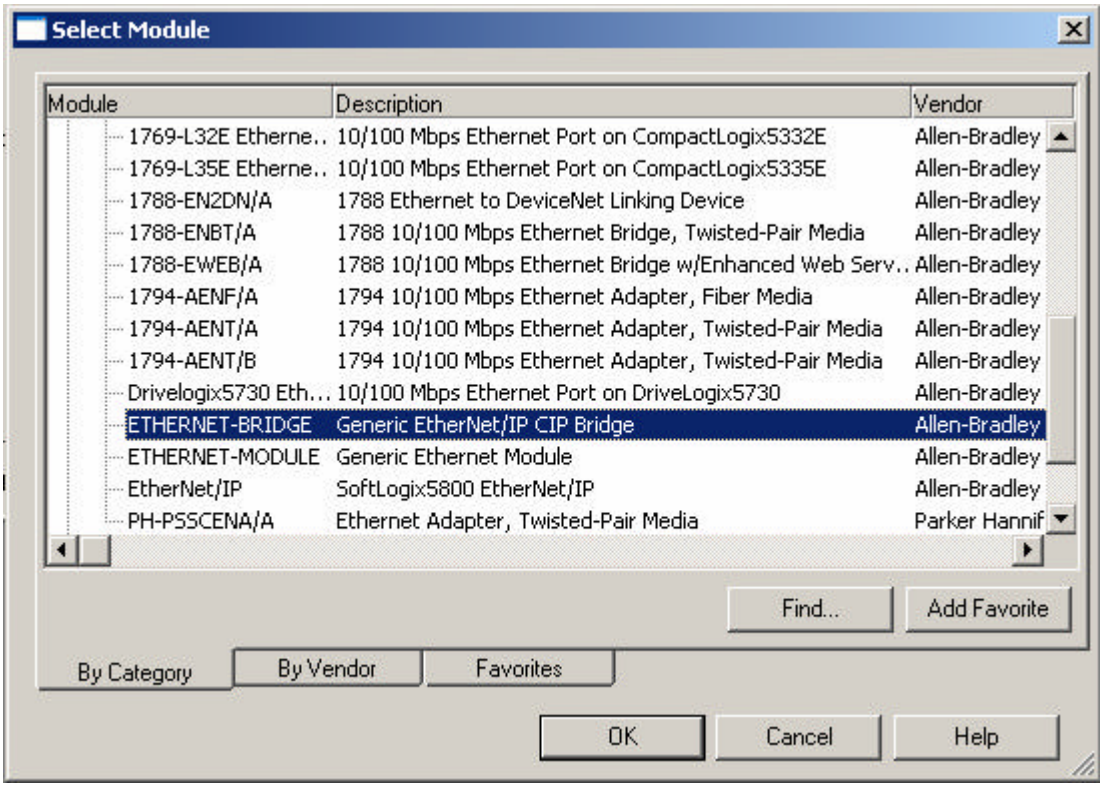

Figure 3.5: Select Generic Ethernet/IP CIP Bridge Module.

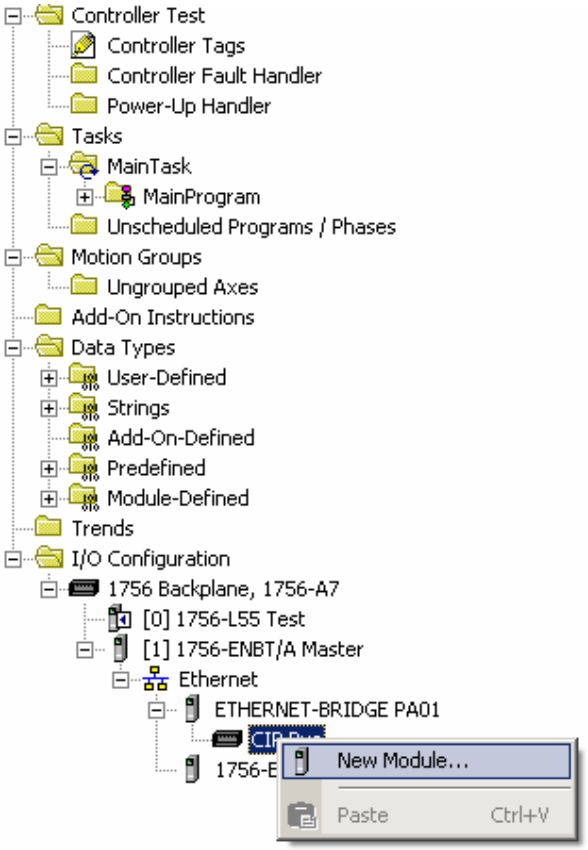

Figure 3.6: Right-click on the CIP Bus tree and select New Module.

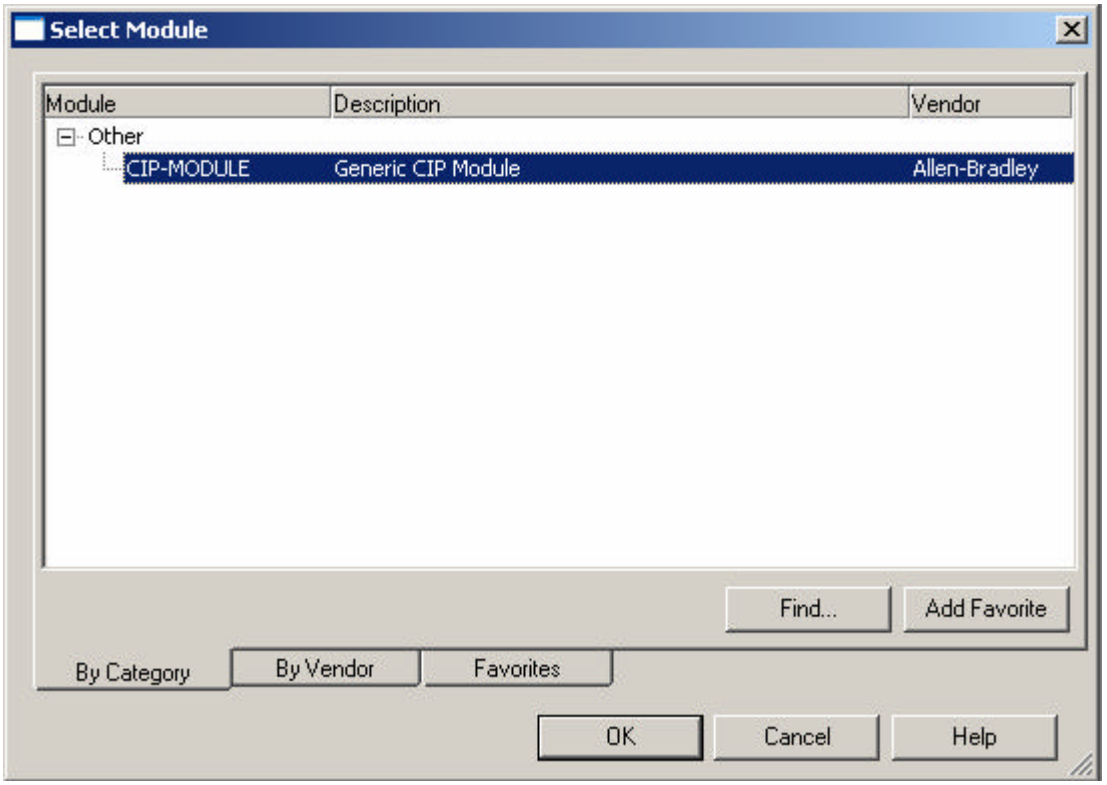

Figure 3.7: Select Generic CIP Module.

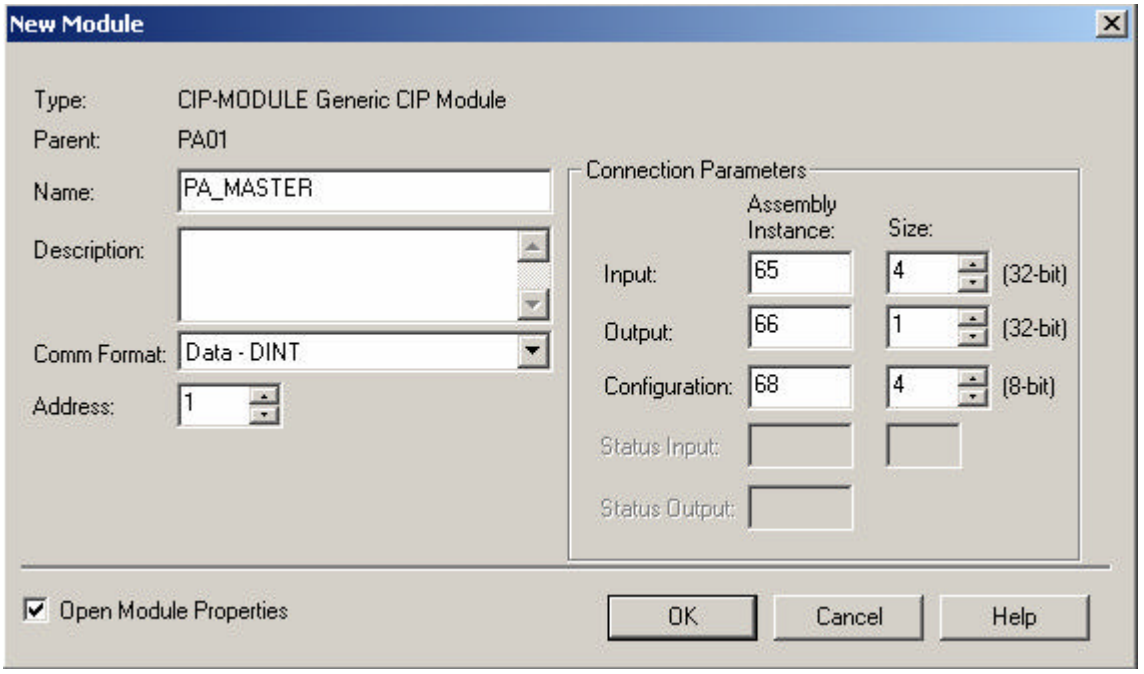

Figure 3.8: Configure the PA Master parameters.

Note: The address of the PA Master must be the same as the 1788HP-EN2PA Profibus PA node number. Default is 1.

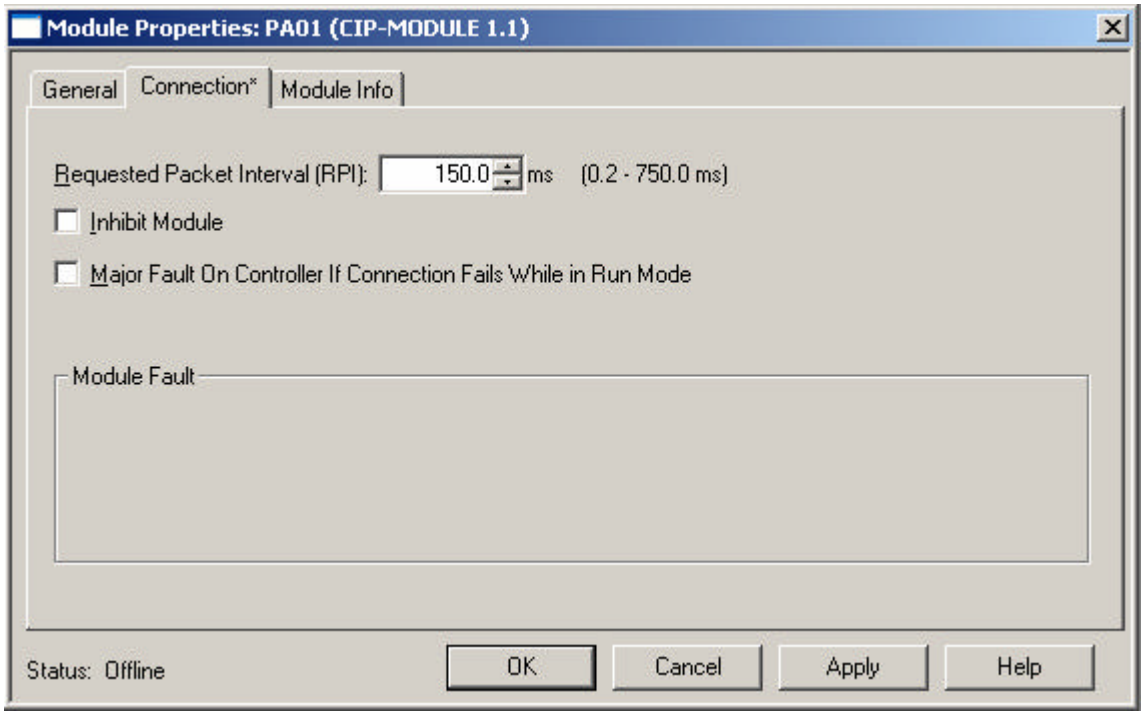

Figure 3.9: Enter the recommended RPI of the PA Master

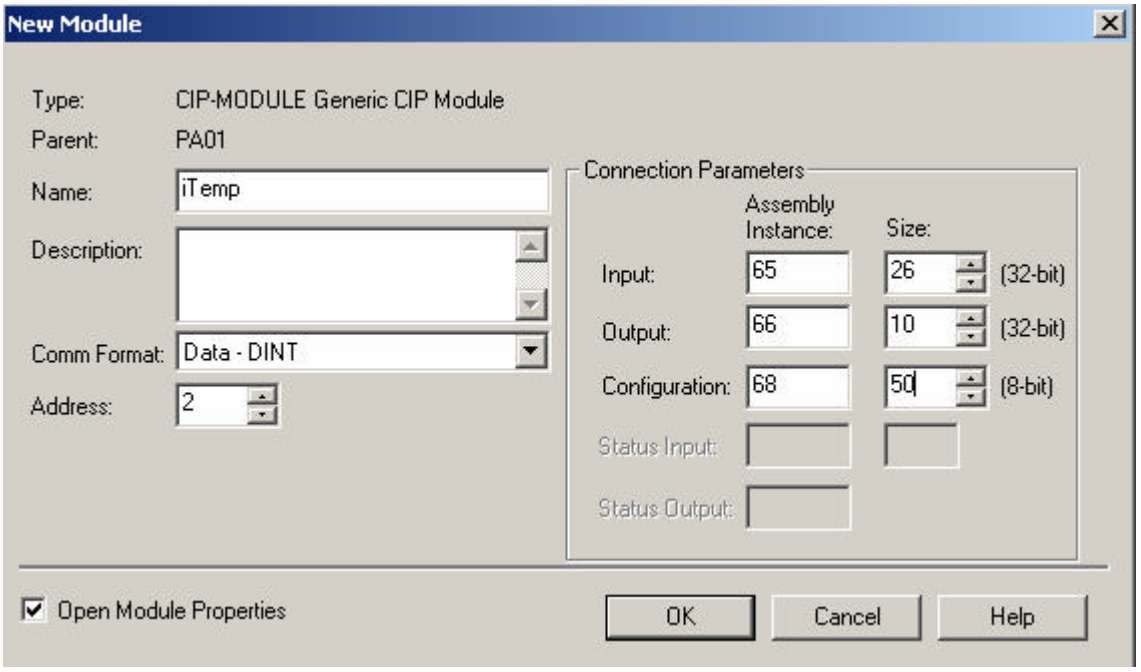

Figure 3.10: Configure the Profibus field device parameters.

Note: The recommended RPI of a Profibus PA field device is the same as the PA Master, 150ms. The Address of each field device must be the same as the block selected in HSNetworxPA. This will ensure that the correct configuration is downloaded to the correct device and that the intended field device data is displayed in the correct *Generic CIP Module.*

The connection between the controller and 1788HP-EN2PA can fail if:

- The specified size of the Input, Output, or Configuration size is incorrect
- The assembly instance of the input, Output and Configuration is incorrect
- An RPI is not set to recommended or reasonable interval.

CHAPTER 4 CONFIGURING FIELD DEVICES

HSNetworxPA is the software that will be used to create the configuration that will be stored in the Logix Controller that is used to access cyclic data of each Field Device. It is supplied with the module and must be installed on any personal computer running MS Windows XP.

4.1. HSNetworxPA

The following will describe how HSNetworxPA will be used to scan the bus, view an instrument's diagnostics and configuration, use GSD files, change EN2PA parameters and downloading configuration data to the Logix Controller and 1788HP-EN2PA module.

NOTE: If the user wants to use a certain instrument, that instrument's GSD file must be added to the GSD library to be recognized by HSNetworxPA. The user cannot add a device without the GSD file. This is done by selecting *Import GSD Files* under the *GSD Wizard* tab in HSNetworxPA. Select a GSD file and click open.

4.1.1 Program startup

When the user starts HSNetworxPA a blank screen will be given as shown below.

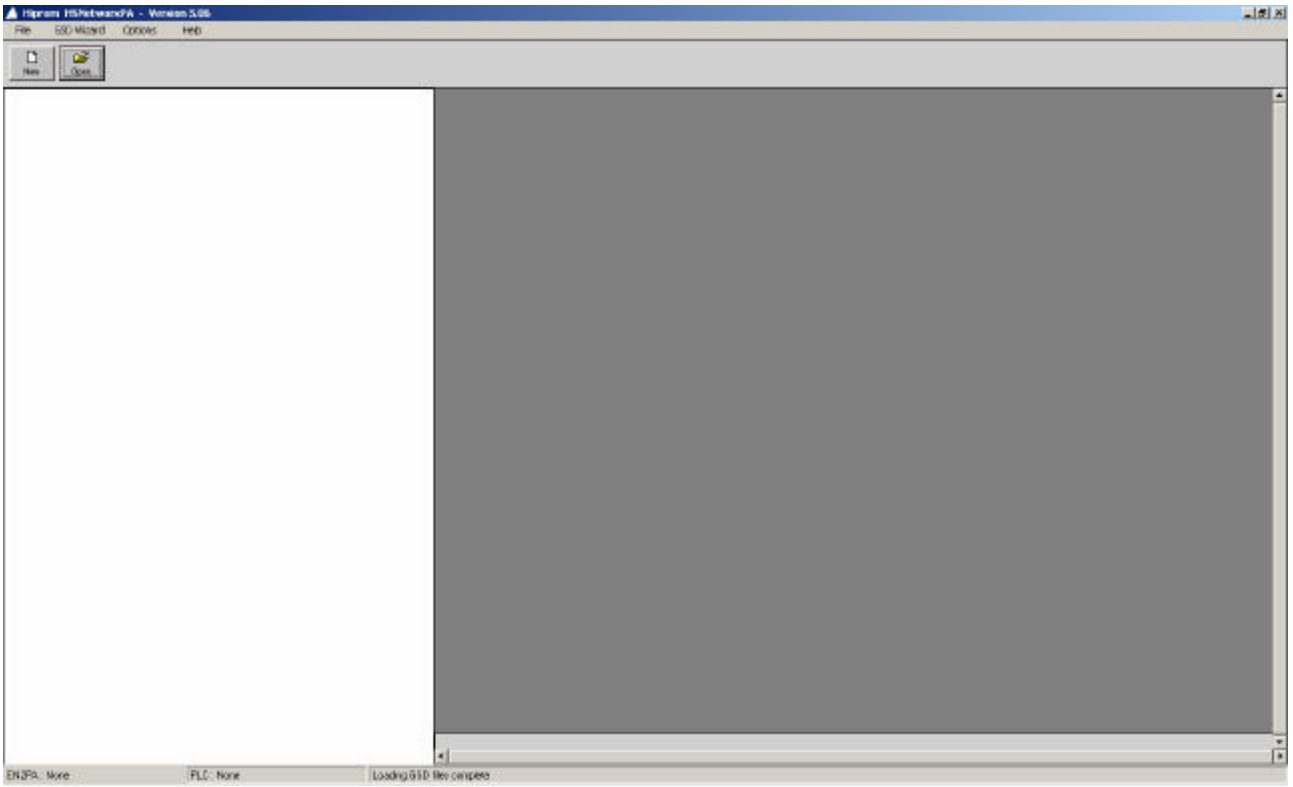

Figure 4.1: HSNetworxPA startup screen.

Create a new project by clicking on the *New* button. The user is prompted with a new project window as shown below.

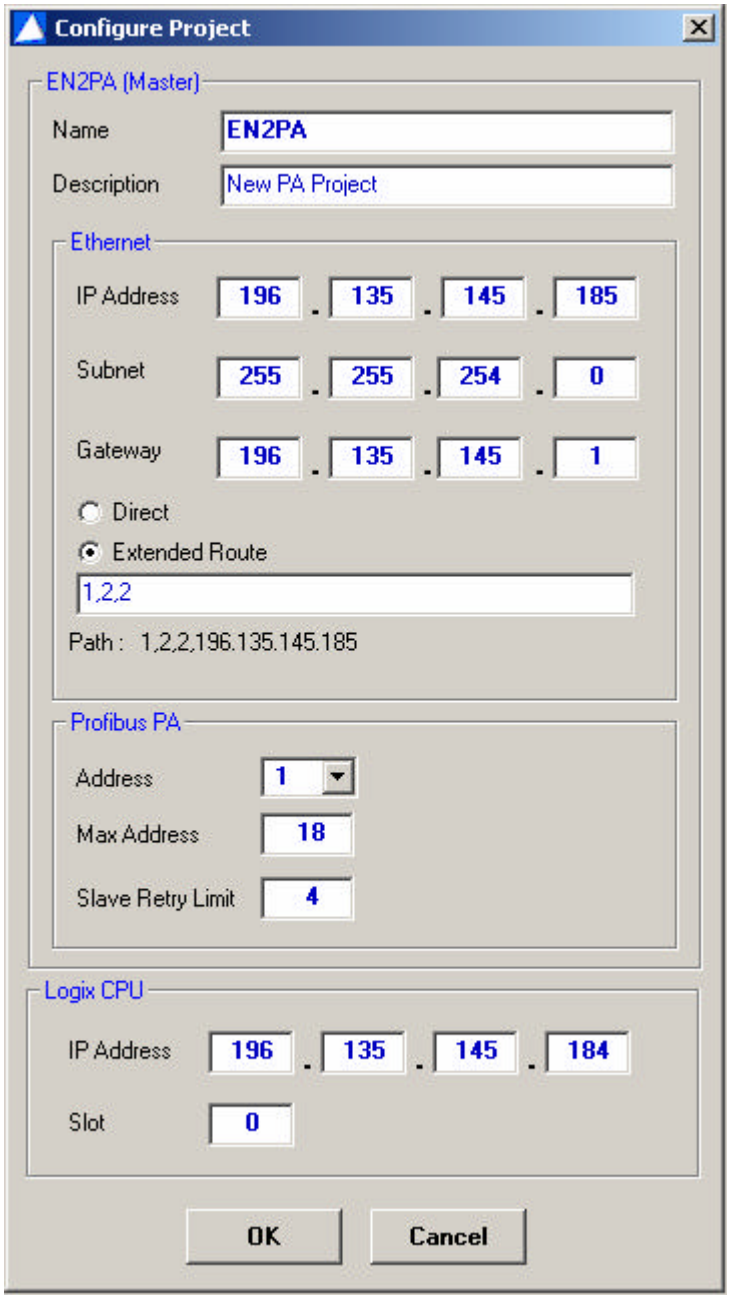

Figure 4.2: HSNetworxPA EN2PA configuration window.

Enter the project name and description of the project that needs to be created. Note that the project name must be the same as the name of the Generic Ethernet/IP CIP Bridge module added in RSLogix 5000 as shown in figure 3.5. Under the Ethernet tab the user must enter the EN2PA module's IP address, subnet mask and Default Gateway (if the module is powered the IP address, subnet mask and Default Gateway will be displayed on the LCD Display). The user can select between one of two options when connecting to the 1788HP-EN2PA. The Direct choice is used when the user's PC and the 1788HP-EN2PA

are both on the same network. The extended route is used when the user's PC and the 1788HP-EN2PA are on different Ethernet networks (if the user has the LAN network on one ENBT and the 1788HP-EN2PA Ethernet network on another ENBT. Note that this is the preferred way of connecting the 1788HP-EN2PA, because it keeps the local network from increasing traffic on the control network). On the Profibus PA tab, the PA Master address has to be selected (this has to be the same as the address selected by the user in RSLogix 5000), the max address that is used for when scanning the bus and the retries when requesting data from a Field Device. The IP address of the Ethernet module that will connect to the Logix controller and in which slot the processor is in that specific rack also has to be entered.

Once a new project has been created, the display will appear as follows:

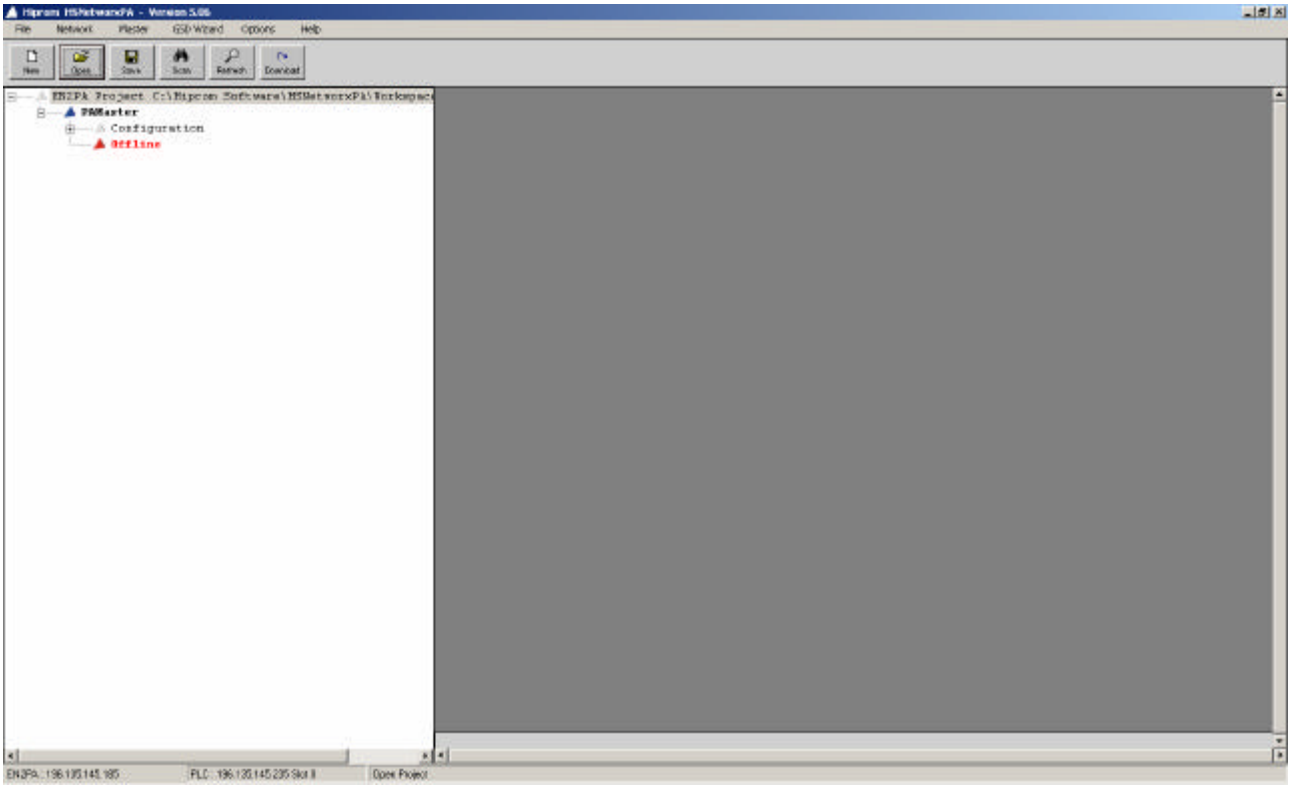

Figure 4.3: PA Master tree is created.

The PAMaster will show that it is offline. If the 1788HP-EN2PA module is powered, has the correct IP address and subnet mask, the user can press the *Refresh* button and the PAMaster will connect and display that it is online. Once it is online the user can expand the tree to view certain parameters and settings of the 1788HP-EN2PA module. Next either add the Profibus PA field devices that are going to be used manually or scan the bus and the field devices will be added automatically with a default configuration.

Manually

Left click on the PAMaster to select it and then right click to display the PAMaster's options. Select *add device* from the list as shown in figure 4.4. Next select a device from the drop-down list (the list consists of the various instruments GSD files in the user's

library). Once a device is selected a default configuration is set (make sure that the node number is the same as the device that is being setup and that the block number is the same as that of needs to be used in the Logix controller). For example, if one of the inputs has to be changed the user can click on the drop down menu of a slot and select a different input if the device supports it (this is discussed in detail in 4.1.2). Once the user has selected all the desired settings click *ok* and the device will be added into the PAMaster tree. If the 1788HP-EN2PA is online and the device is connected the user can click on the refresh button and the specific device icon will go from red to green as shown in figure 4.5. The rest of all the devices can be setup in a similar way until the user has added all the needed field devices to the current 1788HP-EN2PA module.

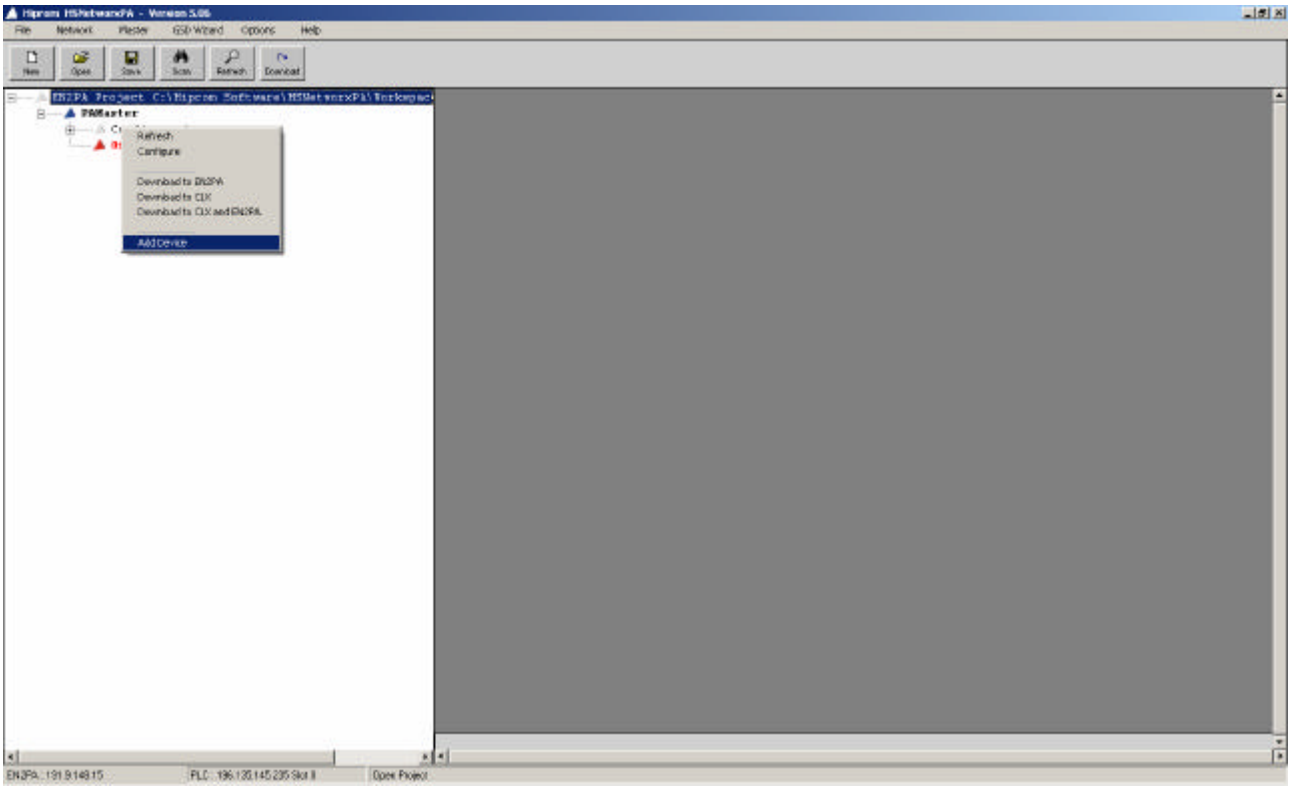

Figure 4.4: Adding a new field device manually to the PA Master tree.

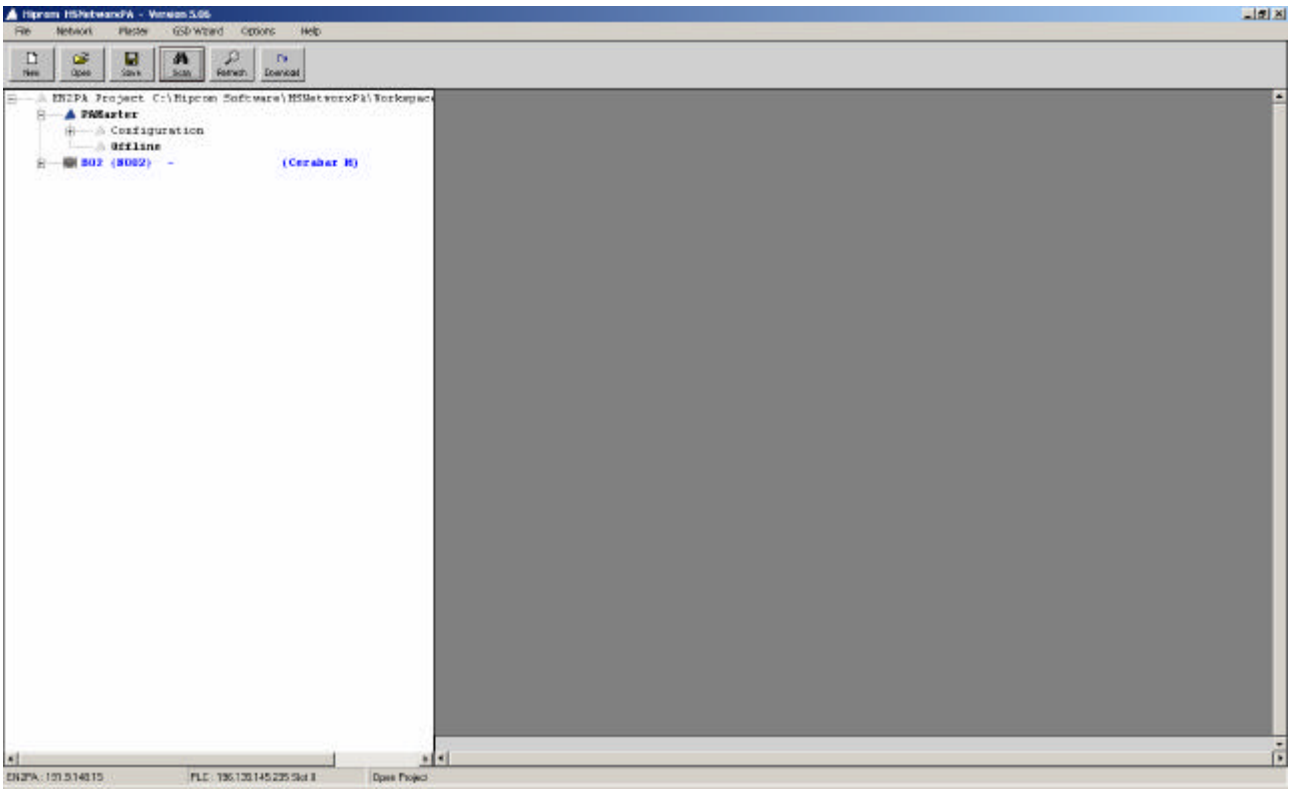

Figure 4.5: A field device is added to the PA Master tree.

Once all the needed field devices have been added and configured, the user can download the all of the devices' configurations to selected Logix Controller by clicking on the download button. This will configure/reconfigure all the field devices connected to the 1788HP-EN2PA and download the configuration to the Logix Controller where it is stored.

Warning:
The user must ensure that the module has already been setup in RSLogix and downloaded as shown in section *3.1 Establishing the Direct Connection*. If this is not done the user will not be able to download the configuration to the Logix Controller.

Automatic

The automatic setup is similar to the manual one with the exception of being able to scan the bus and the instruments are added automatically rather than having to add the devices one by one.

The user can click on the scan button as shown in figure 4.6 and the 1788HP-EN2PA module will start scanning from node address 1 to the max address (selected in figure 4.2.) for devices on the bus. If a device is received it will take its IDENT (identification) number and compare it to the IDENT numbers of the GSD files located in the GSD library. Once a match has been found the device will be added to the tree with a default configuration. If a

device is found but there is no match in the GSD library the user will be prompted with the device node number and IDENT number. Once all devices have been successfully added the tree will be finished. The user can configure each device by right clicking on that device and selecting the configure tab (this is discussed in detail in 4.1.2).

Next the user can download the all of the devices' configuration to selected Logix Controller by clicking on the download button. This will configure/reconfigure all the field devices connected to the 1788HP-EN2PA and download the configuration to the Logix Controller where it is stored.

Warning:
The user must ensure that the module has already been setup in RSLogix and downloaded as shown in section *3.1 Establishing the Direct Connection*. If this is not done the user will not be able to download the configuration to the Logix Controller.

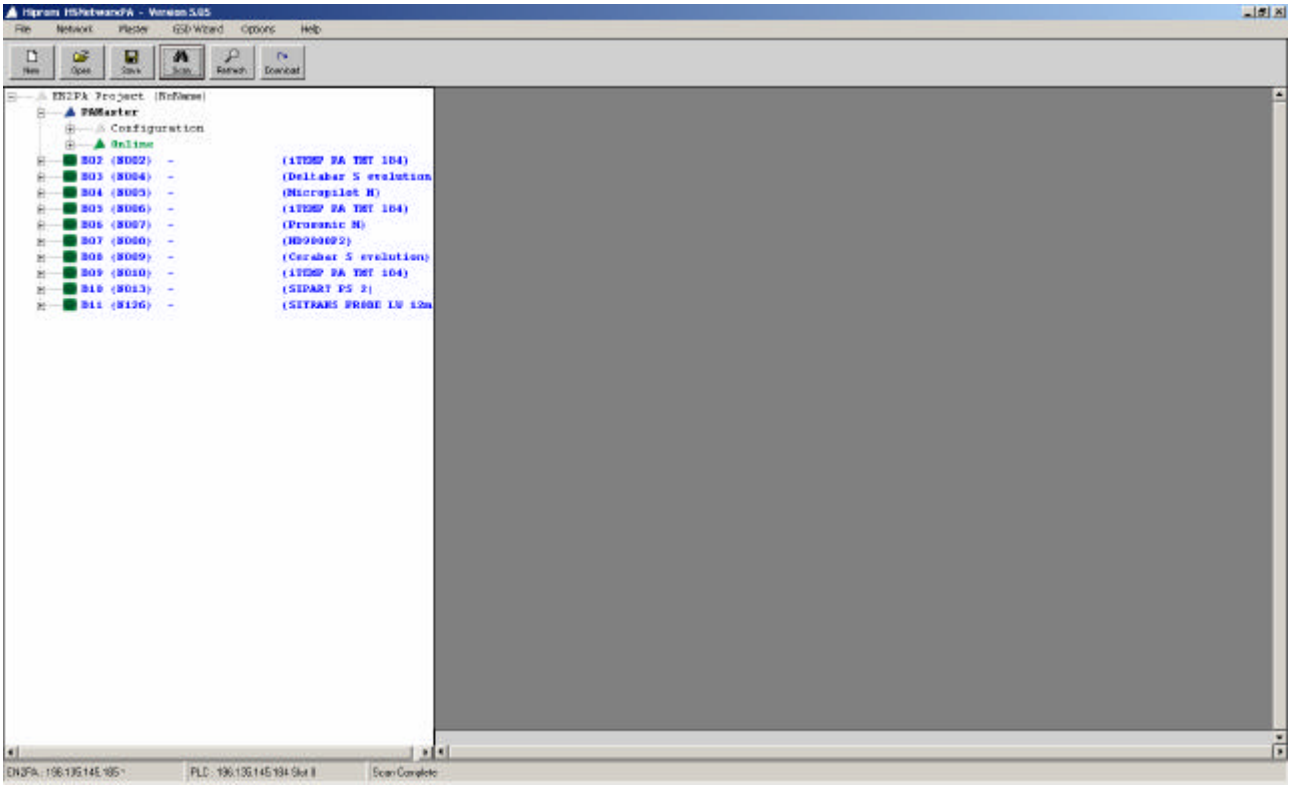

Figure 4.6: A set of field devices have been added by doing a bus scan.

Once the devices on the bus have been configured the IO modules (field devices) on the CIP Bus under the Ethernet/IP CIP Bridge Module will establish a connection and cyclic data exchange will begin. The data of the devices can be seen in the input and output images of the various IO modules added. Section 6 will explain how this is done.

4.1.2 Field device configuration

Once a device has been added to the PAMaster tree, the user must configure the inputs and outputs of the field device by right clicking on the device and selecting *Configure*. The configure screen is presented as shown in Figure 4.7.

Block:
The user can change the block number of the field device by clicking on the drop down menu and selecting any of the allowable block numbers. The user must ensure that the block that has been assigned to that specific field device is the same as the address that is used for the IO module in the CIP Bus under the 1788HP-EN2PA module in RSLogix. Note that if the PA Master profibus node number is 1, it will not be able to use block 1.

Node:
The user can change the node number of the field device by clicking on the drop down menu and select any of the allowable node numbers 1 - 126. Note that if the wrong node number is selected the field device will not respond or configure.

Device:
If a different device is needed the same can be done by clicking on the drop down menu and select any of the listed devices (according to the GSD files in the GSD library).

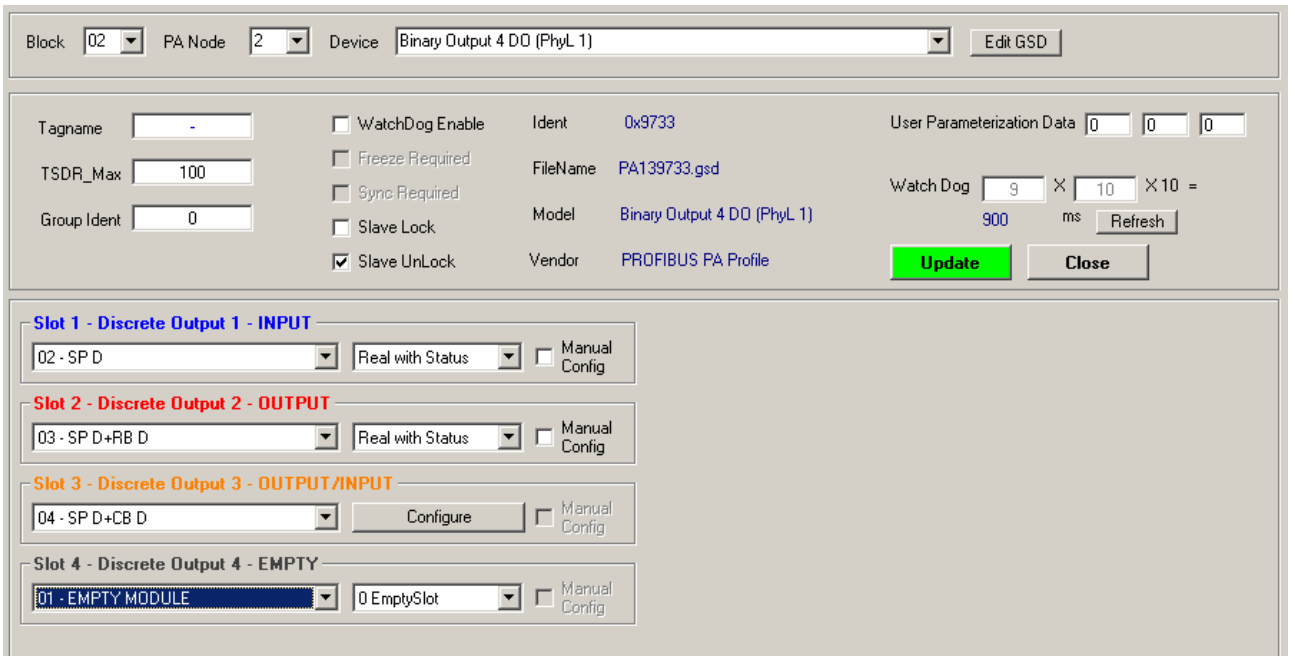

Figure 4.7: Device configuration window.

Watch Dog:
If the Watchdog Enabled tickbox has been set, the watchdog value is automatically calculated using the amount of field devices on the bus. The user can change this by entering new parameters and pressing *Refresh.*

TSDR:
This is the fastest valid slave response set to the field device.

Group Ident:
The user can set certain field devices into different groups. This is reserved for future use (default 0).

WatchDog Enable:
This tickbox enable the watchdog and corresponds to the Watch Dog time value.

Freeze Required:
When freeze mode is activated, the user can send a global control message which keeps the inputs of the slave in a “frozen” state. This is reserved for future use (default unselected).

Sync Required:
When sync mode is activated, the user can send a global control message which keeps the outputs of the slave in a momentary state. This is reserved for future use (default unselected).

Slave Lock:
The user can lock the slave for another master on the bus. This is reserved for future use (default unselected).

Slave Unlock:
The user selects this tickbox to not lock the slave for other masters which allows cyclic data exchange.

Slot x:
The user can select different inputs, outputs and inputs/outputs for the different allowable slots of the slave. Thus using the user manual supplied with the field device, the user can select which input/output to use in which slot and in what format the input/output must be presented in the Controller. The user can press the dropdown menu and select the process variable type and use the second dropdown menu to select how the message is compiled. Some field devices have been assigned slots that support multiple inputs and outputs. For this the user has to select the amount of inputs and outputs and in what formats they are presented in the Controller. This is shown below in figure 4.8. The 1788HP-EN2PA supports 8 inputs and 8 outputs per field device. Note that some field devices support multiple inputs and/or outputs on a single slot. In this case the user must select the “Manual Config” tickbox and manually enter the amount and format of the specific inputs and/or outputs.

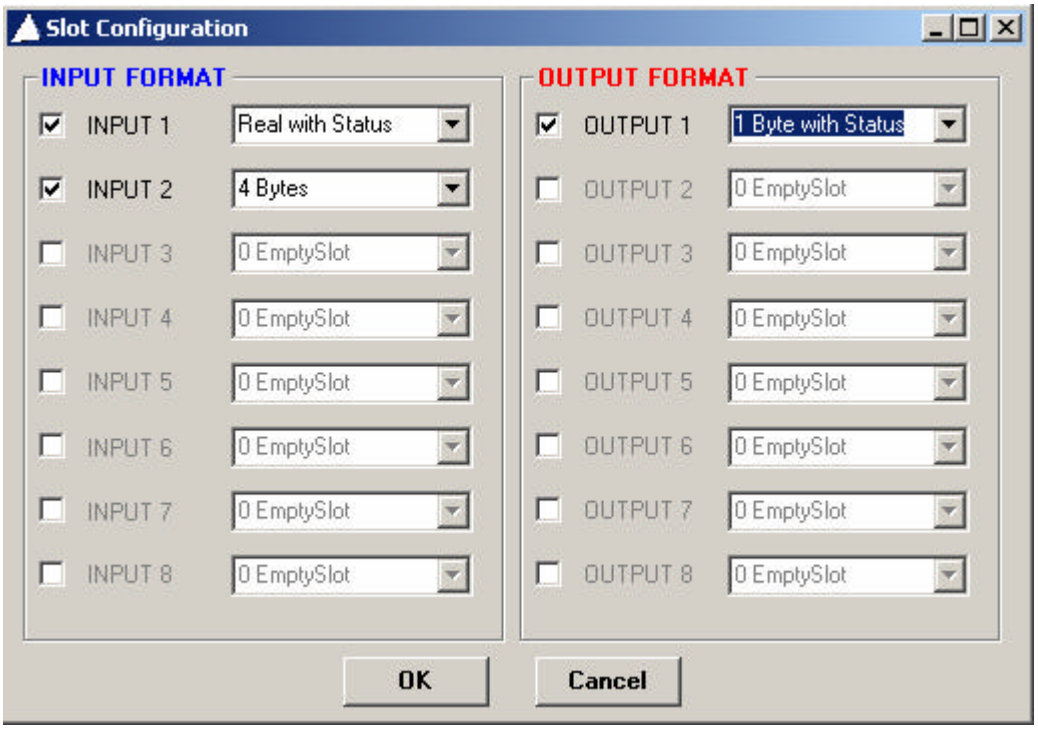

Figure 4.8: Slot input / output configuration window.

CHAPTER 5 FDT / DTM

The 1788HP-EN2PA supports FDT (Field Device Type) / DTM (Device Type Manager) technology. This allows the user to get all the acyclic data benefits from each field device that has a DTM. The user is able to sit in his/her office and do detailed configuration, calibration, audit trails, asset management of all field devices and many other features. The user just needs to install and add the supplied 1788HP-EN2PA DTM in the FDT frame (eg. Fieldcare). All the instruments connected to the 1788HP-EN2PA can then be accessed from within the FDT frame.

CHAPTER 6 I/O ADDRESS MAP

The input and output images of the PA Master and the field devices are defined in the following sections. Note “XXX” is the name chosen by the user for the Generic Ethernet/IP Bridge Module and “?” is the block number that is used for the specific module. It is advised the user use a UDT for the input image.

6.1. PA Master Input Image

Byte	Bit	Point	PV	Point Description
0		PABus Voltage		Byte 0
1				Byte 1
2				Byte 2
3				Byte 3
4		PABus Current		Byte 0
5				Byte 1
6				Byte 2
7				Byte 3
8		Ext Voltage		Byte 0
9				Byte 1
10				Byte 2
11				Byte 3
12		Temperature		Byte 0
13				Byte 1
14				Byte 2
15				Byte 3

Table 6.1: Connected PA Master Input Image.

6.2. PA Master Input Image Description

Field/Value	Description	Location	Type
PABus Voltage	This is the voltage measured on the bus itself.	**XXX:?:I.Data[0]**	REAL
PABus Current	This is the current drawn measured on the bus itself.	**XXX:?:I.Data[1]**	REAL
Ext Voltage	This is the voltage measured from the supply.	**XXX:?:I.Data[2]**	REAL
Temperature	This is the internal temperature measured on the board.	**XXX:?:I.Data[3]**	REAL

Table 6.2: Description of the Connected PA Master Input Image.

6.3. PA Master Output Image

Byte	Bit	Point	PV	Point Description
0		**Reserved**		

Table 6.3: Connected PA Master Output Image.

6.4. Output Image Description

Field/Value	Description	Location	Type
Reserved	This space is reserved for future use.	**XXX:O.Data[0-3]**	DINT

Table 6.4: Description of Connected Output Image.

6.5. Field Device Input Image

Byte	Bit	Point	PV	Point Description
0		PV1 (Real Format)		Byte 3
1				Byte 2
2				Byte 1
3				Byte 0
4		PV2 (Real Format)		Byte 3
5				Byte 2
6				Byte 1
7				Byte 0
8		PV3 (Real Format)		Byte 3
9				Byte 2
10				Byte 1
11				Byte 0
12		PV4 (Real Format)		Byte 3
13				Byte 2
14				Byte 1
15				Byte 0
16		PV5 (Real Format)		Byte 3
17				Byte 2
18				Byte 1
19				Byte 0
20		PV6 (Real Format)		Byte 3
21				Byte 2
22				Byte 1
23				Byte 0
24		PV7 (Real Format)		Byte 3
25				Byte 2
26				Byte 1

27				Byte 0
28		PV8 (Real Format)		Byte 3
29				Byte 2
30				Byte 1
31				Byte 0
32		PV1 (DINT Format)		Byte 0
33				Byte 1
34				Byte 2
35				Byte 3
36		PV2 (DINT Format)		Byte 0
37				Byte 1
38				Byte 2
39				Byte 3
40		PV3 (DINT Format)		Byte 0
41				Byte 1
42				Byte 2
43				Byte 3
44		PV4 (DINT Format)		Byte 0
45				Byte 1
46				Byte 2
47				Byte 3
48		PV5 (DINT Format)		Byte 0
49				Byte 1
50				Byte 2
51				Byte 3
52		PV6 (DINT Format)		Byte 0
53				Byte 1
54				Byte 2
55				Byte 3
56		PV7 (DINT Format)		Byte 0
57				Byte 1
58				Byte 2
59				Byte 3
60		PV8 (DINT Format)		Byte 0
61				Byte 1
62				Byte 2
63				Byte 3
64		PV1 Status		
65		PV2 Status		
66		PV3 Status		
67		PV4 Status		
68		PV5 Status		
69		PV6 Status		
70		PV7 Status		
71		PV8 Status		
72	0	Online		
72	1	Ready		
72	2	Config Fault		

72	3	Ext Diag Avl		
72	4	Diag Support		
72	5	Invalid Slave Response		
72	6	Parameter Fault		
72	7	Master Lock		
72	8	Parameter Req		
72	9	Station Diag		
72	10	WatchDog		
72	11	Freeze Mode		
72	12	Sync Mode		
72	13	Ext Diag Overflow		
72	14	Reserved		
72	15	Reserved		
73		Ident Number		Byte 0
74				Byte 1
75 - 99		Ext Diagnostics [6]		Byte 0
				Byte 1
				Byte 2
				Byte 3

Table 6.5: Connected Field Device Input Image.

6.6. Field Device Input Image Description

Field/Value	Description	Location	Type
Device PV (Real Format)	This is the process values received from each channel of the field device as previously configured in real format.	**XXX:?:I.Data[0] - Data[7]**	REAL
Device PV (DINT Format)	This is the process values received from each channel of the field device as previously configured in DINT format.	**XXX:?:I.Data[8] - Data[15]**	DINT
Device PV Status	This is the status of the PV received from each channel of the field device.(When applicable)	**XXX:?:I.Data[16] - Data[17]**	SINT[8]
Profibus diagnostics	The standard Profibus PA diagnostics are supplied	**XXX:?:I.Data[18]**	INT
Ident Number	The identity number of each field device type is given in this field. Thus the same type of field device from the same vendor will have the same Ident number	**XXX:?:I.Data[18]**	INT
Ext Diagnostics	The extended diagnostics of each device is given. The user can use the GSD file of the specific device to make sense of each field device extended diagnostics. Note	**XXX:?:I.Data[19] - Data[25]**	BIT

	that it is bit aligned.		

Table 6.6: Description of the Connected Field Device Input Image.

6.7. Field Device Output Image

Byte	Bit	Point	PV	Point Description
0		PV1 (DINT/REAL Format)		Byte 0
1				Byte 1
2				Byte 2
3				Byte 3
4		PV2 (DINT/REAL Format)		Byte 0
5				Byte 1
6				Byte 2
7				Byte 3
8		PV3 (DINT/REAL Format)		Byte 0
9				Byte 1
10				Byte 2
11				Byte 3
12		PV4 (DINT/REAL Format)		Byte 0
13				Byte 1
14				Byte 2
15				Byte 3
16		PV5 (DINT/REAL Format)		Byte 0
17				Byte 1
18				Byte 2
19				Byte 3
20		PV6 (DINT/REAL Format)		Byte 0
21				Byte 1
22				Byte 2
23				Byte 3
24		PV7 (DINT/REAL Format)		Byte 0
25				Byte 1
26				Byte 2
27				Byte 3
28		PV8 (DINT/REAL Format)		Byte 0
29				Byte 1
30				Byte 2
31				Byte 3
32		PV1 Status		
33		PV2 Status		
34		PV3 Status		
35		PV4 Status		
36		PV5 Status		
37		PV6 Status		
38		PV7 Status		
39		PV8 Status		

Table 6.7: Connected Field Device Output Image.

6.8. Field Device Output Image Description

Field/Value	Description	Location	Type
Device PV (Real/DINT Format)	This is the process values send to each channel of the field device in real format or DINT format depending on how it was configured.	**XXX:?:O.Data[0] - Data[7]**	REAL/DINT
Device PV Status	This is the status of the PV sent for each channel of the field device.(When applicable)	**XXX:?:O.Data[8]**	SINT[8]

Table 6.8: Description of Connected Field Device Output Image.

CHAPTER 7 SPECIFICATIONS

7.1. Electrical

Input voltage range:	9 – 32V
Current @ 24V (no instruments attached):	180mA
PA Bus supply current (@ 24V)	500mA

7.2. Mechanical

Dimensions
No connectors : 170mm x 179mm x 59 mm (w x h x d)
With connectors : 170mm x 242mm x 59 mm (w x h x d)

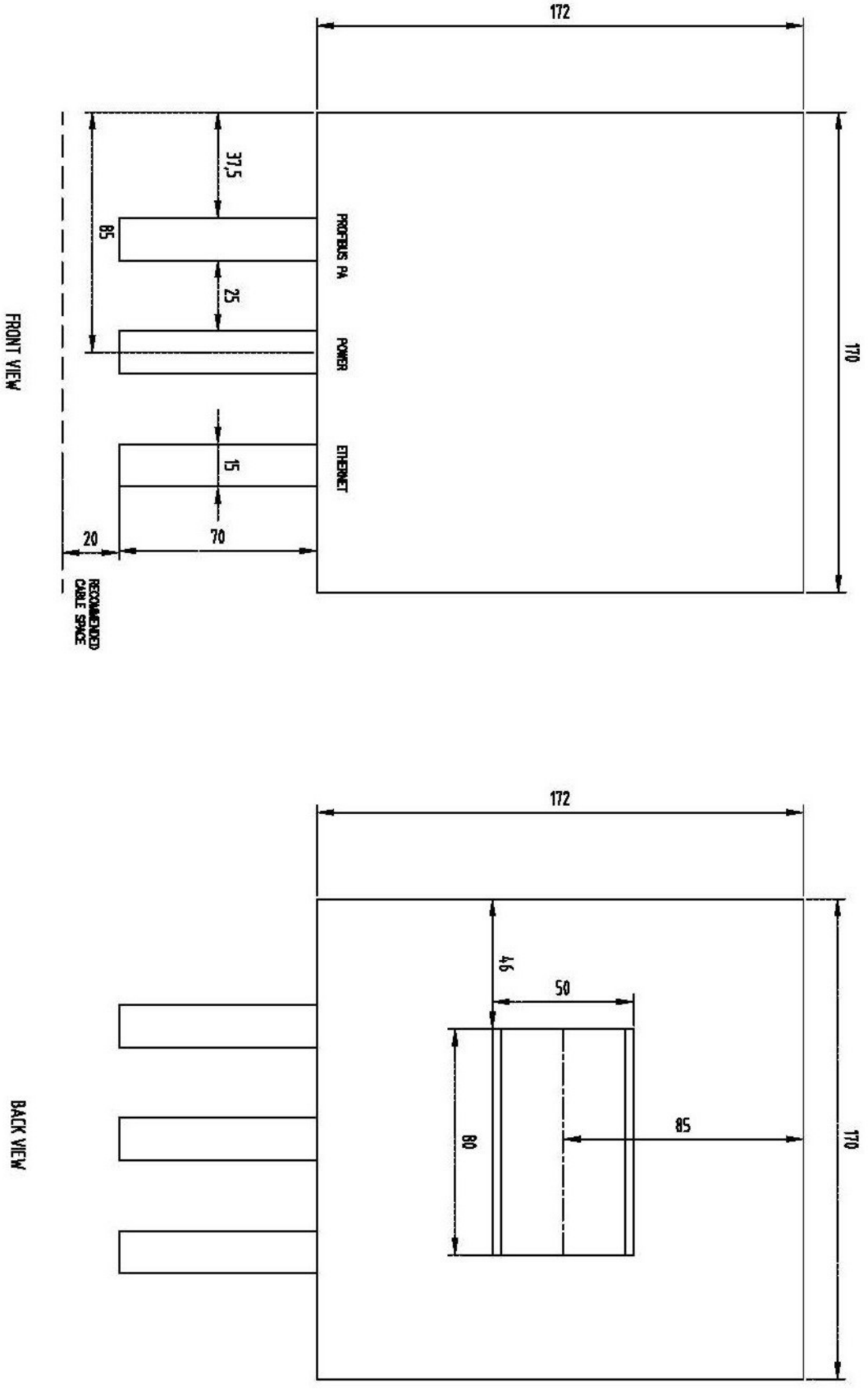

Figure 8.1: Physical dimensions (with connectors plugged in)

APPENDIX A MODULE STATUS

The following sections describe the status indicators of the module:

A.1. LCD Display

Top 16 characters

EN2PA v5.05	Revision number of the current module
PABus: 22.7V	PA Bus voltage
PABus: 130mA	PA Bus current
Ext: 23.2V	External supply voltage
Temp: 38.00C	PCB temperature
196.135.145.236	IP Address
255.255.255.0	Subnet Mask
196.135.145.1	Default Gateway

Bottom 16 characters

Not Configured	No field devices have been configured
Unkown	There is no input data or the module has lost Ethernet communication to the controller
B00 N13 OL> CF>	Block 0 Node 13 is online and configured for cyclic data
B00 N13 OL> CFx	Block 0 Node 13 is online but not configured for cyclic data
B00 N13 OLx CFx	Block 0 Node 13 is not online